Revisions to this document are noted by a stripe in the left-hand margin

SUBJECT: Oil Analysis Test Recommendations

SERIAL NUMBERS AFFECTED: All Allison Transmission, Inc. Commercial Transmissions and Torque Converters

Introduction:

Oil analysis plays an essential role in monitoring and understanding the general condition of the transmission and transmission fluid/filter system. This Service Information Letter (SIL) provides information on recommended oil analysis tests and procedures which provide data necessary to assess the transmission and transmission fluid/filter system. These tests and test data are available from most qualified independent oil analysis laboratories.

Oil Analysis Test Recommendations:

The following is the minimum series of tests required to properly monitor the condition of the transmission and transmission fluid/filter system.

ppm = parts per million cSt = centiStokes ml = milliliter

- Viscosity (cSt) at 100°C (212°F) (ASTM D445)
- Viscosity (cSt) at 40°C (104°F) (ASTM D445)
- TAN (Total Acid Number) (ASTM D664)
- Non-metal Contaminants: Fuel (%vol), Soot (%wt), Water (%vol), Ethylene Glycol (%vol)
- Additive and Contaminant Metals (ppm): Ba, B, Ca, Mg, P, Si, Na, Zn
- Wear Metals (ppm): Fe, Cu, Pb, Al
- Particle Counts (particles/ml) at >5, >l0, >15, >20, >30, and 40 microns

Refer to oil sampling procedure on how to monitor wear metals. Maximum limits for wear metals are not provided due to the multiple variables that affect concentration.

It is vital that all personnel assigned to transmission and transmission fluid/filter system maintenance understand the importance of proper sampling techniques and records keeping in maintaining a quality oil analysis program.

OIL SAMPLING PROCEDURE

Installation of Push Button Sampling Valve

The most uniform samples are obtained when the transmission is in Neutral, idle speed, and at operating temperature. To collect a sample under these conditions, Polaris Laboratories offers a sampling valve that can be

installed in an oil gallery with constantly circulating fluid. Contact Polaris Laboratories to determine which Push Button Sampling Valve is most appropriate for the specific transmission series.

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The Push Button Sampling Valve is shown in Figure 1. For on-highway transmissions, refer to Figure 2, Figure 3, Figure 4, Figure 5, or Figure 6 for recommended placement of the Push Button Sampling Valve. For 5/6/8/9000 Series transmissions, refer to the appropriate Service Manual for location of the main pressure tap.

Refer to Table 1 for Push Button Sampling Valve torque values. An optional remote provision for the Push Button Sampling Valve is depicted in Figure 8.

NOTE: It may be necessary to tap into the cooler line fittings to provide accessibility.

Table 1. Push Button Sampling Valve Torque Values

Model	Torque Values
AT/MT/HT Series	5.4-6.8 N·m (4-5 lb ft)
MD/HD Product Line 1000/2000/2400 Series	10-13 N·m (7-10 lb ft)
5/6/8/9000 Series:	
NPT	5.4-6.8 N·m (4-5 lb ft)
Straight-Thread	10-13 N·m (7-10 lb ft)

CAUTION: Vehicle operating environment must be considered if permanent installation of Push Button Sampling Valve or remote oil sample hose is desired. Vehicles that operate off-road or have low ground clearance pose a greater risk of road/debris impact to the Push Button Sampling Valve and subsequent transmission damage.

Fluid Sampling:

Proper fluid sampling consists of the following procedure:

- The first sample data point must be from an unused, new fluid sample to establish initial levels for which subsequent used oil samples will be compared.
- Second sample data points of used oil samples should be taken per recommendations in .
- Subsequent sample data points of used oil samples should be taken per recommendations in . Subsequent draw of used oil samples will continue until the fluid exceeds any of the limits contained in and .

Once a fluid/filter change is performed, the next sample data point should occur per the recommendations in Table 4. Subsequent sample data points should again be taken per the recommendations in Table 5 until the fluid exceeds any of the limits contained in Table 2 and Table 3.

Extraction of Fluid Sample:

To obtain a representative fluid sample, the following conditions must exist at the time the fluid sample is taken:

1. Transmission sump temperature above 60°C (140°F) (If transmission temperature is not available, engine must be at operating temperature).
2. Engine at idle, transmission in Neutral.
3. Vehicle wheels chocked and vehicle brakes applied.

Before attaching collection bottle, push the button on end of Push Button Sampling Valve to allow a **minimum of three fluid ounces (90ml)** to purge into a container. This removes prior oil/debris trapped in Push Button Sampling Valve and/or remote oil sample hose. Once Push Button Sampling Valve and/or remote oil sample hose has been purged, install collection bottle to the needle/cap assembly and fill collection bottle approximately 3/4 full.

Discard the used tube and probe properly. **Do not reuse**.

Submission of Oil Sample:

Fill out the label completely with the transmission serial number, hour meter/mileage reading, sample date, and hours/miles accumulated on the oil. Indicate whether or not the oil was changed after the sample was taken. Attach the label to the bottle, package carefully using materials supplied by the lab, and send it immediately.

Presence of glycol contamination is analyzed. Cost of oil analysis is included in the cost of the oil analysis kit P/N 29537805.

FLUID ANALYSIS

Transmission protection and fluid change intervals can be optimized by monitoring fluid viscosity and oxidation. Fluid degradation is monitored by testing for viscosity and Total Acid Number (TAN). Fluid oxidation limits are shown in Table 2.

Table 2. Fluid Oxidation Limits

Condition	Limit
Viscosity	+/- 25% Change From New Fluid
Total Acid Number	+3.0 Change From New Fluid

Since limits are referenced from an unused oil sample, when beginning fluid analysis or repurchasing bulk oil stock, i.e. 55 gallon drum and larger, collect a new, unused oil sample and submit for analysis. Viscosity and TAN values measured from unused sample create the baseline that future used oil sample will be measured against.

Monitoring Contaminant Levels:

The presence of contaminants in the transmission fluid is detrimental and indicates a fluid change is necessary. Contaminant limits are shown in Table 3.

Table 3. Contaminant Limits

Contaminant	Limit
Water	0.2% Maximum
Glycol	No Trace Allowed
Alien Fluids*	If Detected, Change Transmission Fluid

*Any fluid not meeting Allison approval. Refer to *www.allisontransmission.com/Parts+Service/Approved Fluids* or the latest revision of Service Information Letter (SIL) 10-TR-99 for a listing of approved fluids.

Monitoring Wear:

Absolute maximum values are not applied to wear metals of an automatic transmission due to the many variables present that affect concentration limits. Wear metal analysis results must be evaluated using a trendline approach. A trendline approach plots the concentration level of each wear metal over a period of time. A line of best fit drawn through the plotted points is considered a trendline. A minimum of 4 data points for each wear metal is required to establish a trendline.

Concern should only occur when significant deviations in the established trendline are present. While trendline analysis on wear metals can prove informative and useful, a transmission removal decision should not be based solely upon the analysis. The results should be used in conjunction with other inspection procedures such as a functional check, road test, oil sump/internal filter inspection, or elevated particle counts. A removal based solely on wear metal analysis may result in an unnecessary teardown. Transmission removal should occur only if the additional investigation warrants it.

If there is ever any doubt on the significance of any fluid analysis reports, or a need to react to a condition, assistance should be sought through a servicing outlet or Allison Transmission regional office.

Table 4. Recommended Initial Fluid Sample Draw

Model	Vocation	Non-TranSynd®	TranSynd®
WT/AT/MT	Severe *	5000 miles (8000 km) 200 hours	25,000 miles (40 000 km) 1000 hours
	General **	15,000 miles (24 000 km) 600 hours	50,000 miles (80 000 km) 2000 hours
HT	Severe	25,000 miles (40 000 km) 600 hours	25,000 miles (40 000 km) 600 hours
	General	25,000 miles (40 000 km) 600 hours	50,000 miles (80 000 km) 1200 hours
1000/2000/2400	Severe	15,000 miles (24 000 km) 600 hours	25,000 miles (40 000 km) 1000 hours
	General	25,000 miles (40 000 km) 1000 hours	50,000 miles (80 000 km) 2000 hours
5/6/8/9000	N/A	250 hours	250 hours

* Severe Vocation: All Retarders, On/Off Highway, Refuse, Transit, and Intercity Coach with duty cycle greater than one (1) stop per mile.
** General Vocation: Intercity Coach with duty cycle less than or equal to one (1) stop per mile and all other vocations.

Table 5. Recommended Subsequent Fluid Sample Rates

Model	Non-TranSynd®	TranSynd®
WT/AT/MT/HT	5000 miles (8000 km)	10,000 miles (16 000 km)
1000/2000/2400	250 hours	500 hours
5/6/8/9000	250 hours	250 hours

NOTE: Fluid sample frequency may need to be modified due to analysis results. For example, if analysis indicates fluid viscosity has changed by 25 percent, customer should sample at a greater frequency than recommended in . Local conditions, severity of operation or duty cycle may require more or less frequent fluid sample intervals that differ from the published recommended fluid sample intervals of Allison Transmission.

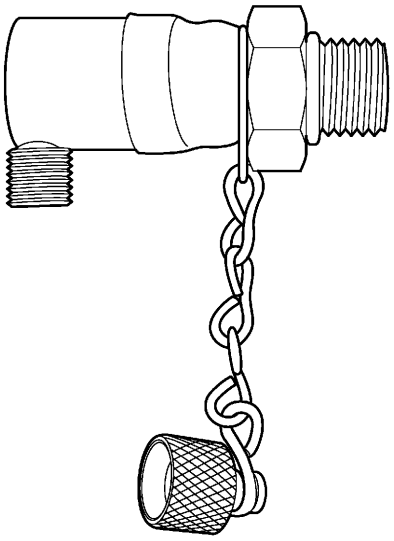

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Figure 1. Push Button Sampling Valve

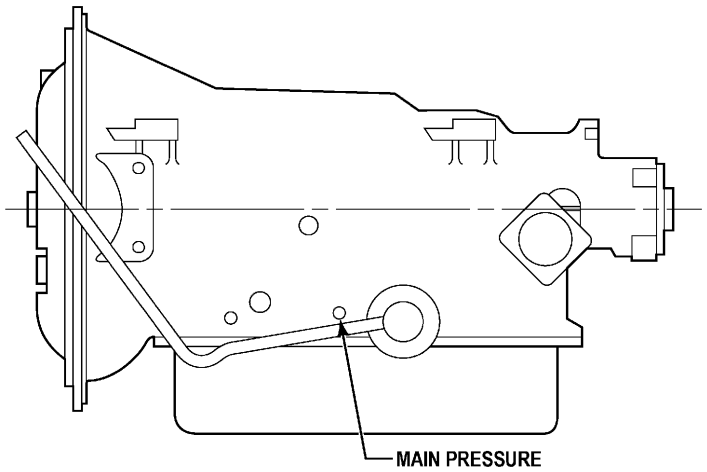

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Figure 2. AT 500/1500 Series

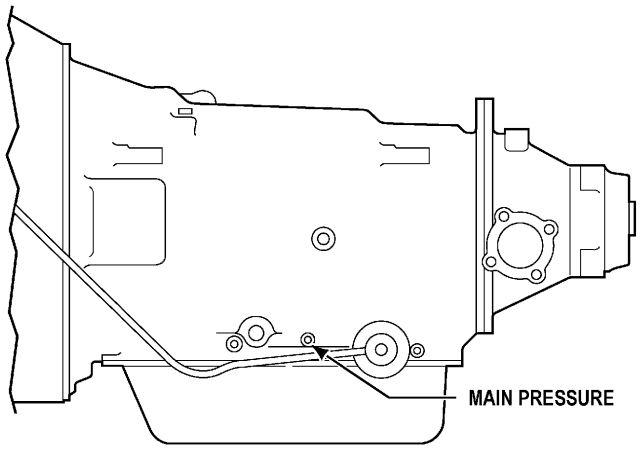

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Figure 3. MT 600 Series

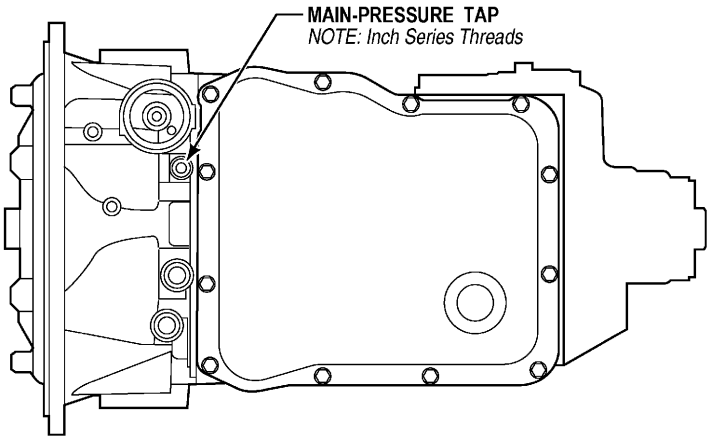

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Figure 4. 1000/2000/2400 Series

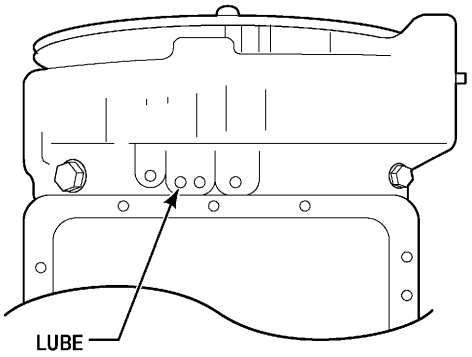

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Figure 5. HT 700 Series

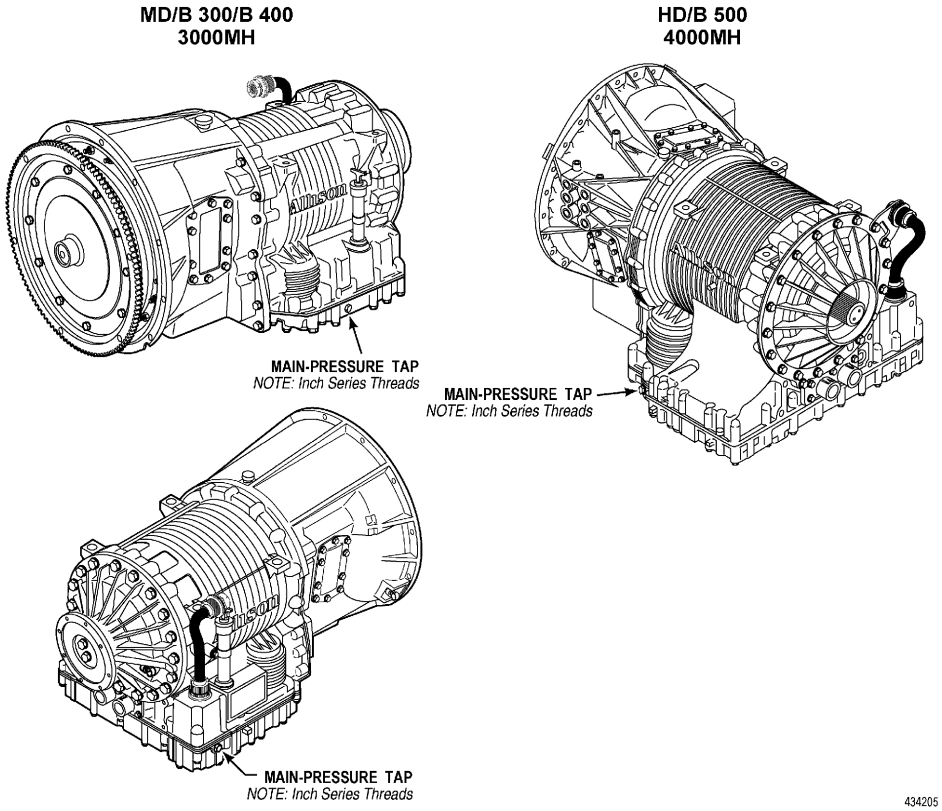

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Figure 6. 3000/4000 Series

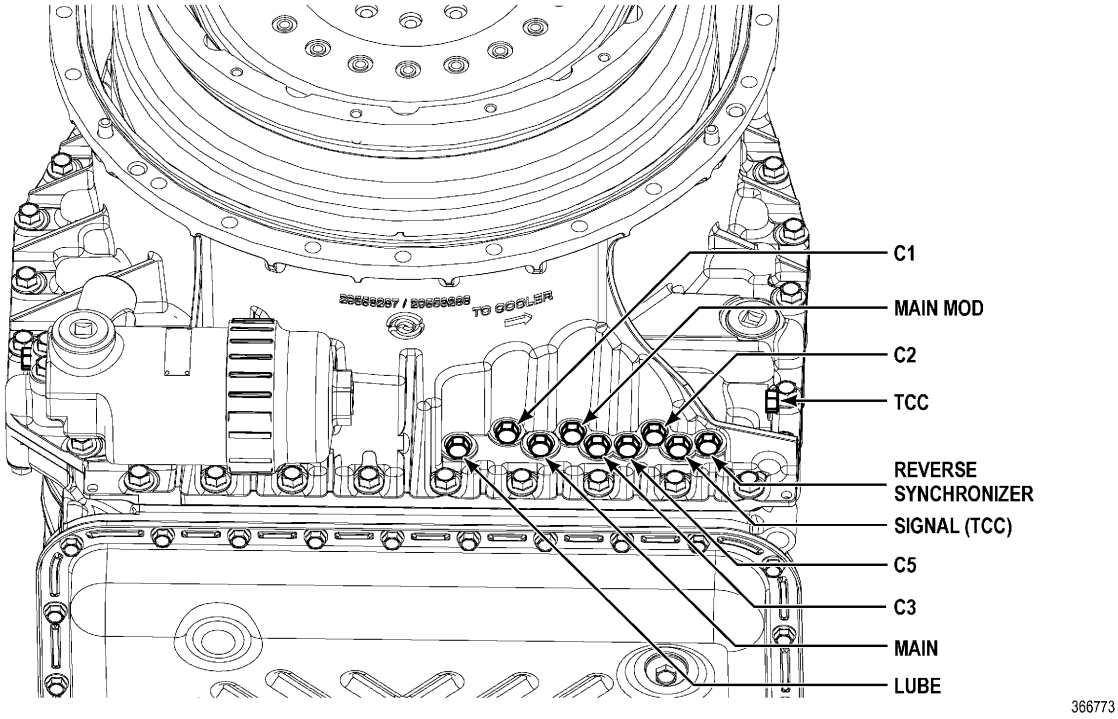

Figure 7. TC10

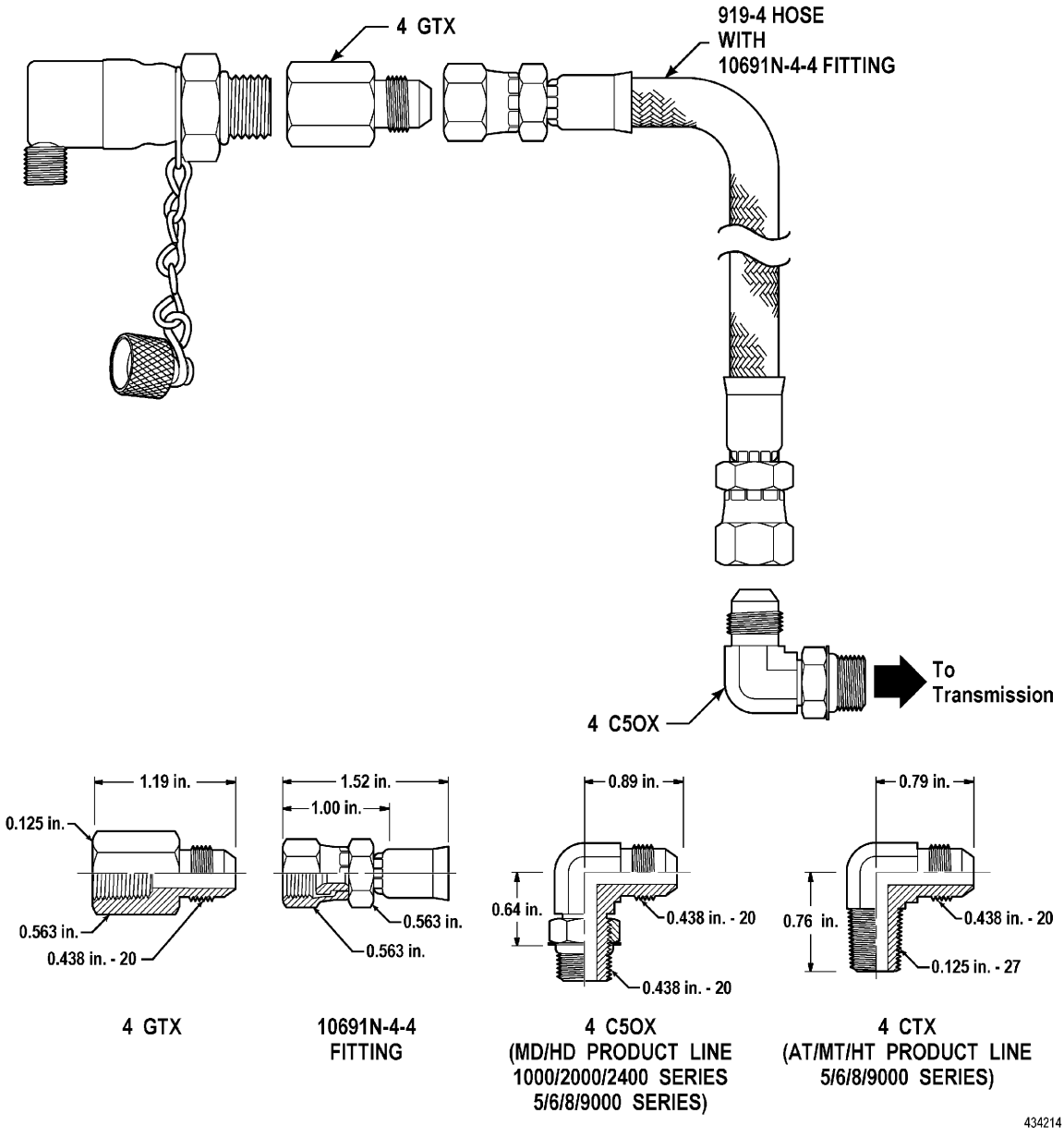

Figure 8.

- Recommended maximum length of hose is 3 meters (10 feet).
- Hose must not contact or have potential to contact sharp or abrading surfaces.
- Hose must be routed carefully to avoid sharp bends, kinking, pinching, cutting, or rubbing.
- The hose must not be under tension between fixed points. This is especially relevant in view of the movement of the powerpack within the frame. "Tension" is considered to be any strain greater than the hose itself.
- Hose must be a minimum of 203 mm (8 in.) from radiant heat sources. Heat sources are defined as engine exhaust systems and manifolds.

- Hose should be secured every 400 mm (16 in.). Clamps must be properly sized to the OD of the hose to avoid crushing or deforming the hose.
- Torque hydraulic fittings to manufacturer's specifications.

Refer To Figure 2, Figure 3, Figure 4, Figure 5 and Figure 6 for placement of fitting.

Refer to Table 1 for adapter to transmission torque value.

NOTE: Components listed are available from Parker Hannifin Corp. with the exception of the Push Button Sampling valve. Hydraulic components other than Parker are acceptable providing they are equivalent or exceed specifications of listed Parker hydraulic components.